

Requested metadata for output from the C20C+ Detection and Attribution Project

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This document lists the metadata for requested variables from the International CLIVAR C20C+ Detection and Attribution project. This is compliant with the CF (NetCDF Climate and Forecast Metadata Convention) standard. It largely follows the CMIP5 format except for the addition of the *experiment_family* and *subexperiment* global attributes.

Attribute label	Description and examples
institution	The name of the institution contributing the simulations; e.g. <i>"Lawrence Berkeley National Laboratory, Berkeley, CA, USA"</i>
institute_id	The abbreviated label of the institution contributing the simulations; e.g. <i>"LBNL"</i>
experiment_family	The label of the scenario under which the simulations were run; either <i>"All-Hist"</i> or <i>"Nat-Hist"</i> for the core experiment
experiment	The label of the scenario estimate under which the simulations were run; e.g. <i>"est1"</i> if <i>experiment_family</i> ="All-Hist"; e.g. <i>"CMIP5-est1"</i> if <i>experiment_family</i> ="Nat-Hist" for the first attributable SST warming estimate based on CMIP5 simulations
subexperiment	A miscellaneous version label for independent use for each model (i.e. <i>"v1-1"</i> for one model is not necessarily related to <i>"v1-1"</i> for another model, or possible even for another scenario with the same model, although there will be less scope for confusion if they can be used consistently across scenarios); e.g. <i>"v1-0"</i>
model_id	The name of the model; e.g. <i>"CAM5.1-2degree"</i> for CAM5.1 running at ~2-degree resolution
run_id	The public label for this simulation; e.g. <i>"run015"</i>
institute_run_id	The institution's internal label for this simulation; e.g. <i>"cam5_1_not_real_world_v1.0_2degree_ACE15"</i>
forcing	A list of the boundary conditions driving the simulations (no particular format is specified, but the description should provide traceability);

Table 1 continued on next page...

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Attribute label	Description and examples
	e.g. "SST=tos-sic_NOAA-OI-v2_for-LBNL-CAM5-1-2degree_NonGHG-Hist_HadCM3-beta50-v1_200501-201301_20130429.nc; SIC=tos-sic_NOAA-OI-v2_for-LBNL-CAM5-1-2degree_NonGHG-Hist_HadCM3-beta50-v1_200501-201301_20130429.nc; co2vmr=278.0516e-6; ch4vmr=721.8941e-9; n2ovmr=272.9596e-9; f11vmr=33.432e-12; f12vmr=0.0; Aerosol=aero_1.9x2.5_L26_2000clim_c091112.nc cyclic year=2000 (sulf:SO4, bcar1:CB1, bcar2:CB2, ocar1:OC1, ocar2:OC2, sslt1:SSLT01, sslt2:SSLT02, sslt3:SSLT03, sslt4:SSLT04, dust1:DST01, dust2:DST02, dust3:DST03, dust4:DST04); Ozone=ozone_1.9x2.5_L26_1850-2015_rcp45_c101108.nc; Land-use=surfdyn_1.9x2.5_rcp4.5_simyr1850-2100_c100322.nc; Solar=SOLAR_SPECTRAL_Lean_1610-2008_annual_c090324.nc; Volcanic=CCSM4_volcanic_1850-2008_prototype1.nc"
parent_experiment_family	The experiment_family entry for the simulation from which this one was initiated; "N/A" for the core experiment
parent_experiment	The experiment entry for the simulation from which this one was initiated; "N/A" for the core experiment
parent_experiment	The subexperiment entry for the simulation from which this one was initiated; "N/A" for the core experiment
parent_run_id	The run_id entry for the simulation from which this one was initiated; "N/A" for the core experiment
contact	Contact details for communication regarding this simulation; e.g. "dstone@lbl.gov"
references	A paper or website where more information about this model and/or simulations can be found; e.g. "http://www.cesm.ucar.edu/models/cesm1.0/cam/"
frequency	"mon" for monthly data, "day" for daily data, "3hr" for three-hourly data, "fx" for time-invariant data
creation_date	The date and time at which this file was generated; e.g. "2012-06-07T16:03:20Z" (created with the Linux command "date -utc +%FT%TZ")
project_id	"C20C+ Detection and Attribution Project"
title	A title describing the model and/or experiment (no format specified); e.g. "CAM5.1 model at 2.5x1.875degree resolution"
license	The description or location of the license under which the data in this file is distributed; e.g. "Creative Commons License: http://creativecommons.org/licenses/by-nc-sa/2.0/"

Table 1: Global file attributes. Additional attributes as appropriate are welcome.

Label	Attributes					Required for
	standard_name	long_name	units	calendar	axis	
lon	"longitude"	"longitude"	"degrees_east"	N/A	"X"	all variables
lat	"latitude"	"latitude"	"degrees_north"	N/A	"Y"	all variables
height	"height"	"height"	"m"	N/A	"Z"	all near-surface variables
plev	"air_pressure"	"pressure"	"Pa"	N/A	"Z"	all variables on pressure levels
time	"time"	"time"	"days_since_YYYY-MM-DD" e.g. "days_since_1960-01-01"	e.g. "365_day" or "gregorian"	"T"	all time-varying variables

Table 2: Attributes for coordinate variables.

Label	Attributes			Level
	standard_name	long_name	units	
orog	"surface_altitude"	"Surface Altitude"	"m"	surface
sftlf	"land_area_fraction"	"Land Area Fraction"	"%"	surface
mrsofc	"soil_moisture_content_at_field_capacity"	"Capacity of Soil to Store Water"	"kg m-2"	surface

Table 3: Attributes for time-independent surface and near-surface variables. Additionally, all of these variables should have a **_FillValue** and/or **missing_value** attribute designating the flag value for non-existent data (suggested value **1.e+20f**). An **original_name** attribute may be useful for providing the label used for the variable in the climate model.

Label	Attributes			Level
	standard_name	long_name	units	
If identical across simulations for a scenario estimate, then provide for one simulation only				
cfc11global	"mole_fraction_of_cfc11_in_air"	"Global Mean Mole Fraction of CFC11"	"1e-12"	global average
cfc12global	"mole_fraction_of_cfc12_in_air"	"Global Mean Mole Fraction of CFC12"	"1e-12"	global average
cfc113global	"mole_fraction_of_cfc113_in_air"	"Global Mean Mole Fraction of CFC113"	"1e-12"	global average
ch4global	"mole_fraction_of_methane_in_air"	"Global Mean Mole Fraction of CH4"	"1e-9"	global average
co2global	"mole_fraction_of_carbon_dioxide_in_air"	"Global Mean Mole Fraction of CO2"	"1e-6"	global average
hcfc22global	"mole_fraction_of_hcfc22_in_air"	"Global Mean Mole Fraction of HCFC22"	"1e-12"	global average
n2oglobal	"mole fraction of nitrous oxide in air"	"Global Mean Mole Fraction of N2O"	"1e-9"	global average

Table 4: Attributes for monthly zero-dimensional variables. Additionally, all of these variables should have a **_FillValue** and/or **missing_value** attribute designating the flag value for non-existent data (suggested value **1.e+20f**). An **original_name** attribute may be useful for providing the label used for the variable in the climate model.

Label	Attributes			Level
	standard_name	long_name	units	
Strongly requested				
clt	“cloud_area_fraction”	“Total Cloud Fraction”	“%”	summed vertically
hfls	“surface_upward_latent_heat_flux”	“Surface Upward Latent Heat Flux”	“W m-2”	surface
hfss	“surface_upward_sensible_heat_flux”	“Surface Upward Sensible Heat Flux”	“W m-2”	surface
hurs	“relative_humidity”	“Near-Surface Relative Humidity”	“%”	2 m
huss	“specific_humidity”	“Near-Surface Specific Humidity”	“fraction”	2 m
mrso	“soil_moisture_content”	“Total Soil Moisture Content”	“kg m-2”	summed through soil layers
mrsos	“moisture_content_of_soil_layer”	“Moisture in Upper Portion of Soil Column”	“kg m-2”	summed through top 10 cm
pr	“precipitation_flux”	“Precipitation”	“kg m-2 s-1”	surface
ps	“surface_air_pressure”	“Surface Air Pressure”	“Pa”	surface
psl	“air_pressure_at_sea_level”	“Sea Level Pressure”	“Pa”	sea level
rlds	“surface_downwelling_longwave_flux_in_air”	“Surface Downwelling Longwave Radiation”	“W m-2”	surface
rlus	“surface_upwelling_longwave_flux_in_air”	“Surface Upwelling Longwave Radiation”	“W m-2”	surface
rsds	“surface_downwelling_shortwave_flux_in_air”	“Surface Downwelling Shortwave Radiation”	“W m-2”	surface
rsus	“surface_upwelling_shortwave_flux_in_air”	“Surface Upwelling Shortwave Radiation”	“W m-2”	surface
snd	“surface_snow_thickness”	“Snow Depth”	“m”	surface
tas	“air_temperature”	“Near-Surface Air Temperature”	“K”	2 m
tasmax	“air_temperature”	“Daily Maximum Near-Surface Air Temperature”	“K”	2 m
tasmin	“air_temperature”	“Daily Minimum Near-Surface Air Temperature”	“K”	2 m
ts	“surface_temperature”	“Surface Temperature”	“K”	surface
Also requested				
rlut	“toa_outgoing_longwave_flux”	“TOA Outgoing Longwave Radiation”	“W m-2”	TOA
rsut	“toa_outgoing_shortwave_flux”	“TOA Outgoing Shortwave Radiation”	“W m-2”	TOA
tauu	“surface_downward_eastward_stress”	“Surface Downward Eastward Wind Stress”	“Pa”	surface
tauv	“surface_downward_northward_stress”	“Surface Downward Northward Wind Stress”	“Pa”	surface
If identical across simulations for a scenario estimate, then provide for one simulation only				
mmrvolc	“volcanic_aerosol_mass_mixing_ratio	“Mass Mixing Ratio of Volcanic Aerosol	“kg kg-1”	summed vertically
od550aer	“atmosphere_optical_thickness_due_to_ambient_aerosol”	“Ambient Aerosol Optical Thickness at 550 nm”	“1”	surface
rsdt	“toa_incoming_shortwave_flux”	“TOA Incident Shortwave Radiation”	“W m-2”	TOA
sic	“sea_ice_area_fraction”	“Sea Ice Area Fraction”	“%”	surface
tos	“surface_temperature”	“Sea Surface Temperature”	“K”	surface

Table 5: Attributes for monthly two-dimensional variables. Additionally, all of these variables should have a **_FillValue** and/or **missing_value** attribute designating the flag value for non-existent data (suggested value **1.e+20f**). An **original_name** attribute may be useful for providing the label used for the variable in the climate model.

Label	Attributes			Levels
	standard_name	long_name	units	
Strongly requested				
hur	“relative_humidity”	“Relative Humidity”	“%”	1000, 925, 850, 700, 600, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 20, 10 hPa.
ta	“air_temperature”	“Air Temperature”	“K”	1000, 925, 850, 700, 600, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 20, 10 hPa.
ua	“eastward_wind”	“Eastward Wind”	“m s-1”	1000, 925, 850, 700, 600, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 20, 10 hPa.
va	“northward_wind”	“Northward Wind”	“m s-1”	1000, 925, 850, 700, 600, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 20, 10 hPa.
wap	“lagrangian_tendency_of_air_pressure”	“omega (=dp/dt)”	“Pa s-1”	1000, 925, 850, 700, 600, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 20, 10 hPa.
zg	“geopotential_height”	“Geopotential Height”	“m”	1000, 925, 850, 700, 600, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 20, 10 hPa.
If identical across simulations for a scenario estimate, then provide for one simulation only				
tro3	“mole_fraction_of_ozone_in_air”	“Mole Fraction of O3”	“1e-9”	1000, 925, 850, 700, 600, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 20, 10 hPa.

Table 6: Attributes for monthly three-dimensional variables. Additionally, all of these variables should have a **_FillValue** and/or **missing_value** attribute designating the flag value for non-existent data (suggested value **1.e+20f**). An **original_name** attribute may be useful for providing the label used for the variable in the climate model.

Label	Attributes			Level
	standard_name	long_name	units	
Strongly requested				
clt	"cloud_area_fraction"	"Total Cloud Fraction"	"%"	summed vertically
hfls	"surface_upward_latent_heat_flux"	"Surface Upward Latent Heat Flux"	"W m-2"	surface
hfss	"surface_upward_sensible_heat_flux"	"Surface Upward Sensible Heat Flux"	"W m-2"	surface
hurs	"relative_humidity"	"Relative Humidity"	"%"	2 m
huss	"specific_humidity"	"Near-Surface Specific Humidity"	"fraction"	2 m
pr	"precipitation_flux"	Precipitation"	"kg m-2 s-1"	surface
ps	"surface_air_pressure"	"Surface Air Pressure"	"Pa"	surface
psl	"air_pressure_at_sea_level"	"Sea Level Pressure"	"Pa"	sea level
rsds	"surface_downwelling_shortwave_flux_in_air"	"Surface Downwelling Shortwave Radiation"	"W m-2"	surface
rsus	"surface_upwelling_shortwave_flux_in_air"	"Surface Upwelling Shortwave Radiation"	"W m-2"	surface
tas	"air_temperature"	"Near-Surface Air Temperature"	"K"	2 m
tasmax	"air_temperature"	"Daily Maximum Near-Surface Air Temperature"	"K"	2 m
tasmin	"air_temperature"	"Daily Minimum Near-Surface Air Temperature"	"K"	2 m
ts	"surface_temperature"	"Surface Temperature"	"K"	surface
uas	"eastward_wind"	"Eastward Near-Surface Wind"	"m s-1"	10 m
vas	"northward_wind"	"Northward Near-Surface Wind"	"m s-1"	10 m
Also requested				
rlds	"surface_downwelling_longwave_flux_in_air"	"Surface Downwelling Longwave Radiation"	"W m-2"	surface
rlus	"surface_upwelling_longwave_flux_in_air"	"Surface Upwelling Longwave Radiation"	"W m-2"	surface
rsdt	"toa_incoming_shortwave_flux"	"TOA Incident Shortwave Radiation"	"W m-2"	TOA
rsut	"toa_outgoing_shortwave_flux"	"TOA Outgoing Shortwave Radiation"	"W m-2"	TOA
sfcWindmax	"wind_speed"	"Daily Maximum Near-Surface Wind Speed"	"m s-1"	10 m

Table 7: Attributes for daily two-dimensional variables. Additionally, all of these variables should have a **_FillValue** and/or **missing_value** attribute designating the flag value for non-existent data (suggested value **1.e+20f**). An **original_name** attribute may be useful for providing the label used for the variable in the climate model.

Label	Attributes			Levels
	standard_name	long_name	units	
Strongly requested				
hur	"relative_humidity"	"Relative Humidity"	"%"	1000, 850, 700, 500, 250, 100, 50, 10 hPa
ta	"air_temperature"	"Air Temperature"	"K"	1000, 850, 700, 500, 250, 100, 50, 10 hPa
ua	"eastward_wind"	"Eastward Wind"	"m s-1"	1000, 850, 700, 500, 250, 100, 50, 10 hPa
va	"northward_wind"	"Northward Wind"	"m s-1"	1000, 850, 700, 500, 250, 100, 50, 10Z hPa
wap	"lagrangian_tendency_of_air_pressure"	"omega (=dp/dt)"	"Pa s -1"	1000, 850, 700, 500, 250, 100, 50, 10Z hPa
zg	"geopotential height"	"Geopotential Height"	"m"	1000, 850, 700, 500, 250, 100, 50, 10Z hPa

Table 8: Attributes for daily three-dimensional variables. Additionally, all of these variables should have a **_FillValue** and/or **missing_value** attribute designating the flag value for non-existent data (suggested value **1.e+20f**). An **original_name** attribute may be useful for providing the label used for the variable in the climate model.

Label	Attributes			Level
	standard_name	long_name	units	
Also requested				
pr	"precipitation_flux"	"Precipitation"	"kg m-2 s-1"	surface
tas	"air_temperature"	"Near-Surface Air Temperature"	"K"	2 m

Table 9: Attributes for three-hourly two-dimensional variables. Additionally, all of these variables should have a **_FillValue** and/or **missing_value** attribute designating the flag value for non-existent data (suggested value **1.e+20f**). An **original_name** attribute may be useful for providing the label used for the variable in the climate model.